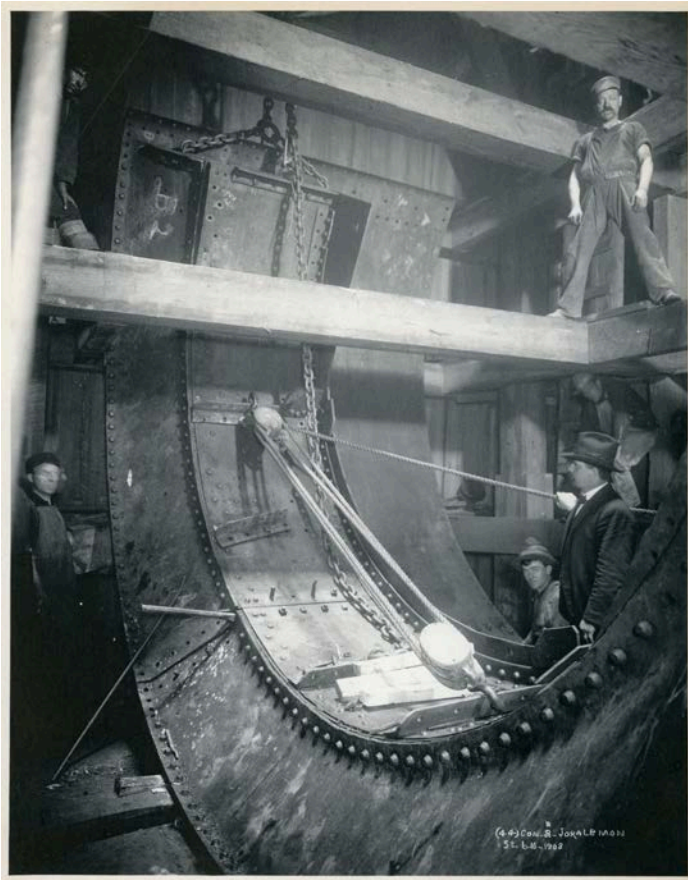
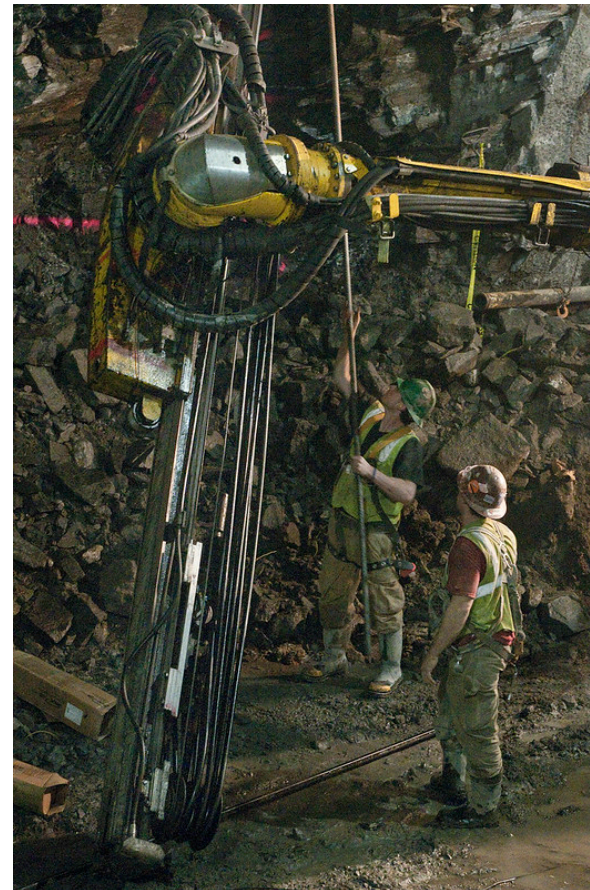


SUBWAY CONSTRUCTION THEN & NOW



East River Tunnel construction, 1903
Photograph by Pierre P. Pullis
New York Transit Museum
Subway Construction Photograph Collection



Second Avenue Subway's 72nd Street Station, 2012
Photograph by Patrick Cashin
Metropolitan Transportation Authority

THEN

SUBWAY
CONSTRUCTION
THEN
& NOW



Lexington Avenue, between
105th and 106th Streets
Photograph by Pierre P. Pullis
New York Transit Museum
Lundin Collection

This 1913 photo of Lexington Avenue, between 105th and 106th Streets in Manhattan shows a construction method called **cut and cover**. Like the name suggests, this method involved cutting or digging a trench in the street, installing the necessary infrastructure, and then covering with the street on top. During construction business went on as usual around construction. With temporary wooden structures placed over the work below, trolleys and other traffic were able to pass over top of the construction. Many of our first subway tunnels were built using this method beginning in 1900, which made construction faster, cheaper, and easier than trying to dig deep under the ground. It allowed sand hogs (the nickname given to tunnel workers) to avoid the difficult and unstable bedrock underneath most of Manhattan called Manhattan schist.

THEN

SUBWAY
CONSTRUCTION
THEN
& NOW

NEW YORK
TRANSIT
MUSEUM



Laborers Doing Assembly and Riveting
Work: Sixth Avenue Line (IND), 1938
New York Transit Museum
Eugene Casey Tunneling Collection

This photo shows deep rock tunneling under 6th Avenue between 10th and 15th Streets. Unlike cut and cover, these tunnels are deep underground and cannot be built by digging through the street. Drillers made holes for dynamite that helped explode the rock, and then excavators removed the spoil and cleared the way for the shield, a device that kept workers safe as they dug. The shield is a temporary support that acts to protect the workers from falling debris as they chip away at rocks ahead of the shield and put in place permanent support walls behind it. Sandhogs used pickaxes, shovels, air powered drills, and sometimes dynamite, to break through the rock.

THEN

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THEN
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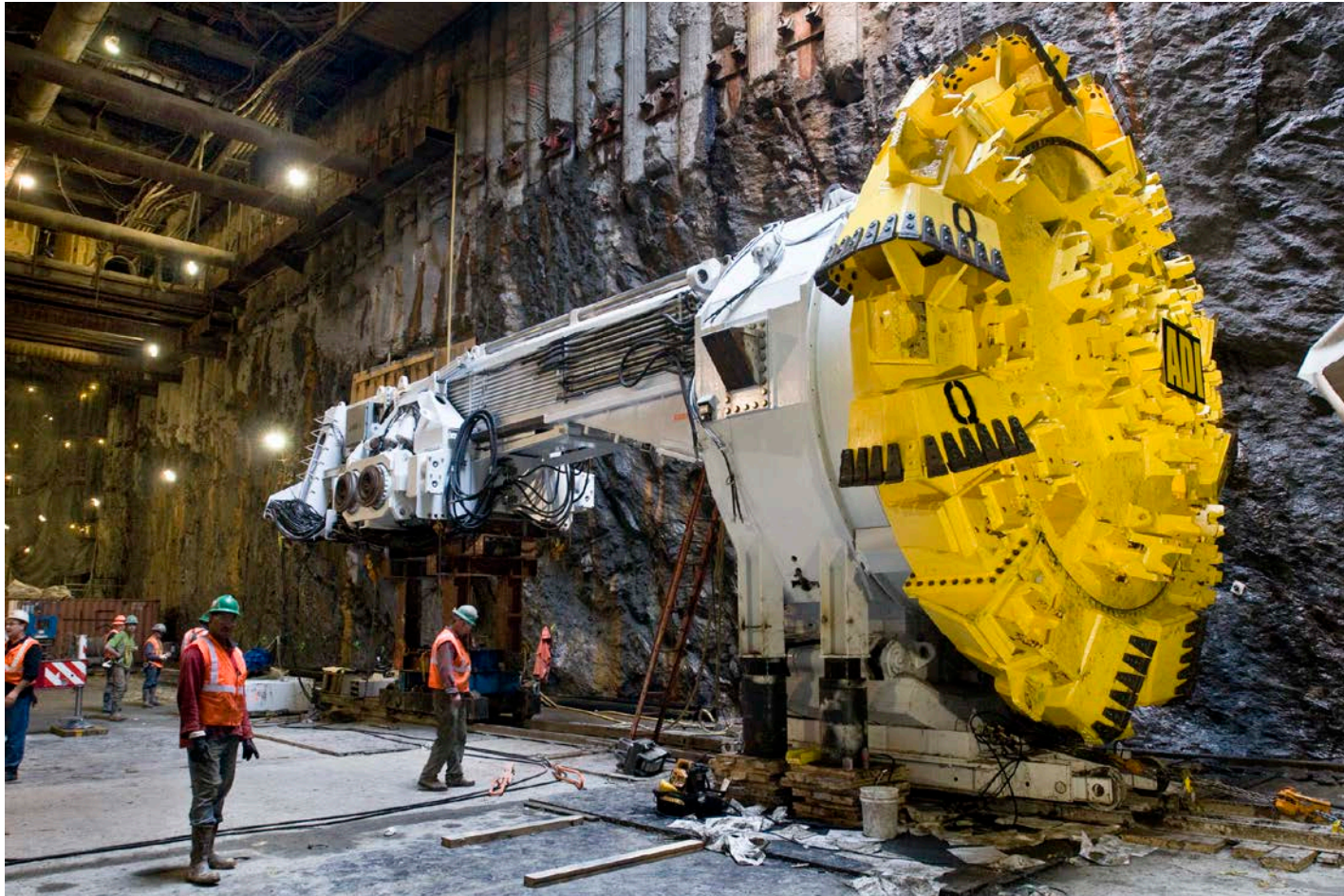
NEW YORK
TRANSIT
MUSEUM



Joralemon Street Tunnel construction, 1905
New York Transit Museum
Subway Construction Photograph Collection

Underwater Tunneling, the third type of construction, occurs underneath the river. This photo shows construction of the Joralemon Street tunnel. Subway water tunnels are built approximately 30 feet below the riverbed. Because of the immense pressure exerted by 30 feet of rock, sand, and silt, plus 50 feet of water, such tunnels were in danger of collapsing. To counteract this force, tunnels underwater were pumped full of pressurized air, which pressed out against the walls of the tunnel and kept it in place. However, this pressurized air made for difficult working conditions for sandhogs. When working in pressurized air, workers were in danger of developing decompression sickness, similar to what divers might experience. Because of this, workers could only spend three hours under water before needing to spend several hours above ground. Before exiting or entering the tunnel, sandhogs would adjust to the pressurized air in a decompression chamber, also called an air-lock or a man-lock.

NOW



Tunnel Boring Machine, 2010. Photograph by Patrick Cashin. Metropolitan Transportation Authority

Today workers do not have to dig by hand when tunnels are dug deep underground, but instead are assisted by **tunnel boring machines**, or TBMs for short. This massive machine is over 300 feet long and weighs around 485 tons! Attached to the front is a blade head 22 feet in diameter which acts as a large drill that breaks apart the rock and then moves debris out to the back on a conveyor belt. Tunnel boring machines dig about 50 feet per day. The TBM pictured above, named Adi, was used to dig the tunnels for the Second Avenue Subway.

NOW



Second Avenue Subway Construction 86th Street Station, 2013
Photograph by Patrick Cashin
Metropolitan Transportation Authority



Second Avenue Subway Construction 96th Street, 2012
Photograph by Metropolitan Transportation Authority

Cut and cover construction is still used today. The street is excavated in sections and support for metal decking is installed (above). This allows traffic to flow above while construction continues beneath the decking. A cut will remain open to bring in supplies and remove excavation material (left). Cut and cover is often used to construct stations, which need to be close to street level to easily access, and for certain sections of tunnel as well.

THINGS TO THINK ABOUT...

1. How is construction different today than in the past?
2. Why do you think these changes were made?
3. What is the closest train station to your house? Can you find out what year it was built? How do you think it was constructed?
4. How do you think construction will change in the future? Can you think of a new way to build tunnels?